

## SUMMARY

of the doctoral thesis entitled:

### RESEARCH ON THE DIVERSIFICATION OF RAW MATERIAL RESOURCES FOR DEVELOPING GLUTEN-FREE PRODUCTS

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**KEYWORDS:** celiac disease, gluten-free products, protein sources, sorghum, buckwheat, peas, rheology

The PhD thesis, titled "**Research on the diversification of raw material resources for developing gluten-free products**" is structured in 2 parts and includes **7 chapters**. **Part I** represented by **The current state of knowledge** and **Part II** includes **Own Research**. This research extends over **158 pages** and includes **26 tables** and **52 figures** and contribution from **260 up-to-date bibliographic references**. At the end of the thesis, the **general conclusions**, **original contributions** and **future research directions** are presented. A list of the topical scientific papers published during these PhD study can be found in the appendices.

The theoretical part of the research is presented in the first 3 chapters where review of the scientific works from specialized literature relating to the approached research topics is presented. For example, a brief presentation of the celiac disease and its impact on people's quality of life is included here. Moreover, this section also covers the classification and characterization of the raw materials used in a gluten-free diet, as well as the ingredients used to achieve the required daily intake of essential nutrients. Also, the challenges encountered during the entire technological process of obtaining gluten-free products are presented, as well as approaches in improving the properties of gluten-free bread using lactic acid bacteria.

The experiments addressed in the first part regarding own research, presented in Chapter IV, entitled "**Experimental study on the complex characterization of gluten-free flours**" consisted in the complex characterization of the raw materials that will be considered the basis for the development of gluten-free products. The raw materials selected in this thesis were: rice flour, buckwheat flour, sorghum flour, pea protein powder, coconut flour. They were studied regarding the rheological properties using the Mixolab complex system, the physico-chemical and functional characteristics, as well as the *in vitro* digestibility of the protein.

Chapter V "**Experiments carried out to establish the consistency and the raw materials in order to develop gluten-free cookies**", covers the experiments in order to establish both the optimal percentage of raw materials for the development of gluten-free cookie-type products, as well as the optimal consistency of the dough using the rheometer and texture analyzer. The cookies were also analyzed regarding physico-chemical and microbiological parameters following the changes that appeared during the period of validity as well as from sensory point of view in order to evaluate the consumer's perception. Two optimal variants of gluten-free cookies were obtained that had the following composition: (1) 150 g rice flour, 30 g buckwheat flour, 90 g pea protein powder, 30 g coconut flour and 150 ml water and (2) 150 g rice flour, 30 g sorghum flour, 90 g pea protein powder, 30 g coconut flour and 150 ml water. According to Regulation (EC) No. 1924/2006, both types of cookies fall into the category of "source of protein" products, and the buckwheat-based cookie also falls into the category of "source of fiber" products, having at least 3 g of fiber/100 g of product. In addition, after determining the glycemic index based on the *in vitro* analysis of starch digestibility, it was determined that

sorghum and buckwheat cookies had a glycemic index with approximately 13.2% and 6.3% lower compared to a control sample (obtained from 100% rice flour) respectively.

Chapter VI "**Research regarding the establishment of the technological process for obtaining gluten-free bakery products - bread**" is focused on the development of gluten-free bread-type products using a mixture consisting of rice flour, buckwheat and pea protein powder, through the indirect method of dough preparation using a *Lactobacillus sanfranciscensis* starter culture. The microbiological, physico-chemical, color, texture and sensory parameters of the breads were analyzed in order to establish the conformity of the bread samples. By using starter cultures of *Lactobacillus sanfranciscensis* in the technological process of manufacturing gluten-free bread, it was possible to eliminate the use of additives. Moreover, the use of gluten-free sources with high nutritional value (buckwheat flour and pea protein powder) leads to gluten-free bread development with improved nutritional properties. This product could be beneficial for people suffering from celiac disease, but also for consumers interested in healthier products.

The general conclusions of the study, recommendations and bibliographic notes can be found at the end of this PhD thesis.